

CLAIMS

1. ~~High-speed optical pulse transmitter, characterized~~
ized in that it comprises:

- 5 - a first optical signal modulator;
 - a second optical pulse modulator, optically linked to
 said first optical signal modulator;
 - a generator of a continuous optical signal, optically
10 linked to said first and second optical modulators;
 - means of driving said first optical signal modulator with
 an electrical signal bearing a coded information with a
 preset repetition frequency; and
15 - means of driving said second modulator, these comprising
 a combining element for combining a first periodic
 electrical signal at said preset frequency and at least one
 second periodic electrical signal at a second frequency
 which is a harmonic of said preset frequency.

2. High-speed optical pulse transmitter, according to
20 Claim 1, characterized in that said means of driving said
 second modulator include a circuit for generating said
 first periodic electrical signal at said preset frequency,
 driven by a clock signal associated with said electrical
 signal bearing a coded information, and a circuit for
25 generating said second periodic electrical signal at said
 second frequency.

3. High-speed optical pulse transmitter, according to
30 Claim 1, characterized in that said circuit for generating
 said second periodic electrical signal comprises a
 frequency multiplier, linked to said circuit for generating
 said first periodic electrical signal.

4. High-speed optical pulse transmitter, according to
35 Claim 1, characterized in that said means of driving said
 first optical signal modulator include a circuit for
 supplying an electrical signal bearing a coded information

~~with a preset repetition frequency to said first optical modulator.~~

5 5. High-speed optical pulse transmitter, according to Claim 1, characterized in that said means of driving said first optical signal modulator include a circuit for generating said electrical signal bearing a coded information, in response to an external signal.

10 6. High-speed optical pulse transmitter, according to Claim 3, characterized in that said circuit for generating said first periodic electrical signal comprises an output bearing a synchronization signal, said synchronization signal being in a preset time relationship with said clock signal, said output being linked to said means of driving said first optical signal modulator.

15 7. High-speed optical pulse transmitter, according to Claim 5, characterized in that said means of driving said first optical signal modulator comprise a decision circuit receiving said electrical signal bearing a coded information and said clock signal.

20 8. High-speed optical pulse transmitter, according to Claim 5, characterized in that said combining element is a distributed-constants circuit.

25 9. Pulsed transmission system, comprising at least one transmission station, one reception station, one fibre-optic line linking said transmission station and said reception station and at least one optical amplifier serially linked along said fibre-optic line, characterized in that said transmission station comprises a unit for generating signals which comprises:

30 - an optical signal modulator, able to modulate an optical signal with a series of pulses bearing a coded information
35 ~~and with a preset repetition frequency;~~

an optical pulse modulator, optically linked to said optical signal modulator, able to modulate an optical signal with a first sequence of periodic pulses of preset duration T_{FWHM} and with said preset repetition frequency;

- 5 - a generator of a continuous optical signal, optically
linked to said optical signal modulator and to said optical
pulse modulator, with preset wavelength; and
- means of driving said optical pulse modulator, comprising
an element for combining a first periodic electrical signal
10 at said preset frequency and at least one second periodic
electrical signal at a second frequency which is a harmonic
of said preset frequency.

10. Pulsed transmission system, according to Claim 9,
15 characterized in that said fibre-optic line has overall
chromatic dispersion greater than zero at the wavelength of
said optical signal.

11. Pulsed transmission system, according to Claim 10,
20 characterized in that said fibre-optic line comprises
chromatic dispersion compensation means able to compensate
a fraction of the chromatic dispersion of the line, and
which are such that the total chromatic dispersion of the
line is between 100 and 120% of the compensated dispersion.

12. Pulsed transmission system, according to Claim 11, characterized in that said transmission station comprises:

- several units for generating signals, each of which comprises a respective generator of a continuous optical signal at a respective wavelength, different from that of the other units, each unit being able to generate an appropriate pulsed optical signal at a respective wavelength; and

- means of multiplexing said pulsed optical signals.

35 13. Pulsed transmission system, according to Claim 12,
~~characterized in that said reception station comprises~~

~~means for wavelength demultiplexing said pulsed optical signals.~~

14. Pulsed transmission system, comprising at least one transmission station, at least one reception station, one fibre-optic line linking said at least one transmission station and said at least one reception station and at least one optical amplifier serially linked along said fibre-optic line, characterized in that said at least one transmission station comprises a unit for generating signals which comprises:

- a first optical signal modulator, able to modulate an optical signal with a series of pulses bearing a coded information with a preset repetition frequency;
- a second optical pulse modulator, optically linked to said first optical signal modulator, able to modulate an optical signal with a first sequence of periodic pulses of preset duration T_{FWHM} , with said preset repetition frequency; and
- a generator of a continuous optical signal, optically linked to said first and second optical modulators, with preset wavelength;

in which the ratio T_{bit}/T_{FWHM} , between the inverse of said preset repetition frequency T_{bit} and said preset duration T_{FWHM} of the pulses, is between 6 and 10.

15. Transmission system, comprising at least one transmission station, at least one reception station, one fibre-optic line linking said at least one transmission station and said at least one reception station and at least one optical amplifier serially linked along said fibre-optic line, characterized in that said transmission station includes at least an interfacing unit adapted to be optically coupled to an external optical source, said at least an interfacing unit including:

- a receiving and converting device to receive, from said external optical source, a first optical signal bearing a coded information, and to convert said first optical signal

into an electrical signal bearing said coded information,
and

- 5 - an emitting device, electrically coupled to said receiving and converting unit to receive said electrical signal, and adapted to feed to said fibre-optic line a second optical signal of RZ type bearing said coded information.

10 16. Transmission system according to Claim 15, characterized in that said fibre-optic line includes:

- a first optical conductor element, having a first chromatic dispersion at the wavelength of said second optical signal;
15 - a second optical conductor element, having a second chromatic dispersion at the wavelength of said second optical signal, said second chromatic dispersion being of opposite sign with respect to said first chromatic dispersion, said second optical conductor element being serially linked to said first optical conductor element;
20 said first chromatic dispersion and said second chromatic dispersion being of preset values such that the overall chromatic dispersion is greater than zero at the wavelength of said second optical signal.

25 17. Transmission system according to Claim 16, characterized in that said second optical signal has, for at least one portion of his propagation path in one of said first and second optical conductor elements, an intensity of a value such as to cause phase self modulation of said
30 second optical signal.

18. Transmission system according to Claim 16, characterized in that said optical amplifier has amplification characteristics such as said second optical
35 signal has, in at least one portion of his propagation path in one of said first and second optical conductor elements, an intensity of a value such as to cause phase self modulation of said second optical signal.

19. ~~Transmission system according to one of Claims 15 to 18, characterized in that said first optical conductor element is a step-index optical fibre.~~

20. Transmission system according to one of Claims 15 to 18, characterized in that said first optical conductor element is an optical fibre with non-zero dispersion.

21. Method of high-speed optical transmission, comprising the steps of:

- generating an optical signal;
- modulating said optical signal with a periodic first signal at a preset frequency;
- modulating said optical signal with a second signal, said second signal bearing a coded information at said preset frequency;

in which said step of modulating said optical signal with a first periodic signal involves applying to an optical modulator a drive signal comprising said first periodic signal at said preset frequency and at least one harmonic of said preset frequency.

22. Method of high-speed optical transmission, comprising the steps of:

- receiving a first modulated optical signal bearing a coded information;
- converting said first modulated optical signal into an electrical signal bearing said coded information;
- modulating a second optical signal with a sequence of pulses, of preset time duration;
- modulating said second optical signal with said electrical signal bearing said coded information;
- supplying said second optical signal modulated with said sequence of pulses and said electrical signal in an optical transmission line.

23. ~~Method according to claim 22, characterized in that~~
said step of modulating a second optical signal with a
sequence of pulses comprises modulating a second optical
signal with a first sequence of periodic pulses of preset
duration T_{FWHM} and with a preset repetition frequency; and
in that the ratio T_{bit}/T_{FWHM} , between the inverse T_{bit} of said
preset repetition frequency and said preset duration T_{FWHM}
of the pulses, is between 6 and 10.

24. Method according to claim 22 or 23, characterized
in that said step of modulating a second optical signal
with a sequence of pulses involves generating said sequence
of pulses by combining a first periodic electrical signal
at a first preset repetition frequency and at least one
second periodic electrical signal at a second frequency
which is a harmonic of said first preset repetition
frequency.

25. Transmission system comprising at least one
transmission station, one reception station and one fibre-
optical line optically linking said transmission station
and said reception station, characterized in that said
transmission station comprises a first interfacing unit
adapted to be optically coupled to an external optical
source to receive a first optical signal bearing a coded
information and adapted to feed to said fibre-optical line
a second optical signal of RZ type bearing said coded
information; and in that said reception station comprises a
second interfacing unit optically coupled to said fibre-
optical line to receive said second optical signal and
adapted to be optically coupled to a subsequent optical
equipment to transmit to said subsequent optical equipment
a third optical signal bearing said coded information.

26. Transmission system according to claim 25,
characterized in that said transmission system is a portion
of an optical network and said external optical source is
~~comprised in a further portion of said optical network.~~

27. ~~Transmission system according to claim 25,~~
characterized in that said second optical signal includes
a sequence of periodic pulses, said periodic pulses having
a preset duration T_{FWHM} and a preset repetition frequency,
the ratio T_{bit}/T_{FWHM} between the inverse T_{bit} of said preset
repetition frequency and said preset duration T_{FWHM} of said
periodic pulses being between 6 and 10.

28. Method of high-speed optical transmission,
comprising the steps of:

- receiving, from a fibre-optic line, a modulated optical
signal including a sequence of periodic pulses bearing a
coded information, and
- regenerating said optical signal to obtain a further
modulated optical signal with optical characteristics
matched to a subsequent optical equipment.

29. Method according to claim 28, characterized in
that said step of regenerating comprises the steps of:

- converting said modulated optical signal into an
electrical signal bearing said coded information;
- modulating a further optical signal with said electrical
signal to obtain said further modulated optical signal.

30. Method according to claim 28, characterized in that
said periodic pulses have a preset duration T_{FWHM} and a
preset repetition frequency, the ratio T_{bit}/T_{FWHM} between the
inverse T_{bit} of said preset repetition frequency and said
preset duration T_{FWHM} of said periodic pulses being between
6 and 10.

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